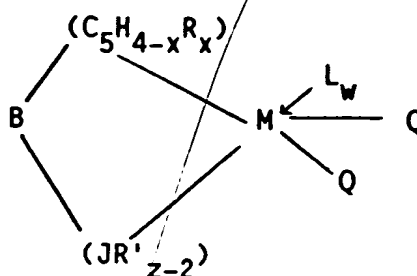
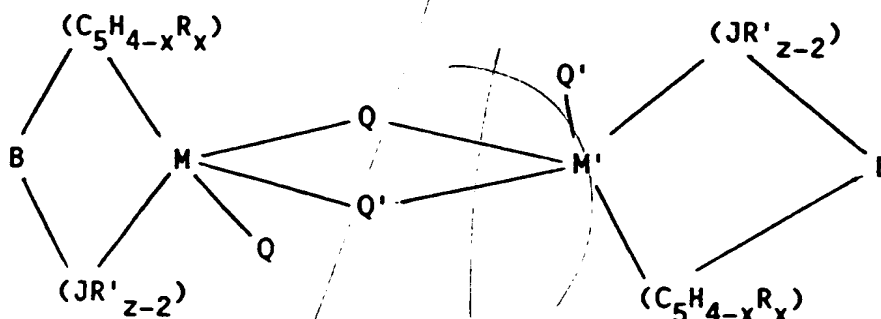


CLAIMS:

- 1 1. A compound having the general formula:



or



- 2 wherein M is Zr, Hf or Ti;
 3 $(C_5H_{4-x}R_x)$ is a cyclopentadienyl ring which is
 4 substituted with from zero to four substituent groups R, "x" is 0, 1,
 5 2, 3, or 4 denoting the degree of substitution, and each substituent
 6 group R is, independently, a radical selected from a group consisting
 7 of C_1-C_{20} hydrocarbyl radicals, substituted C_1-C_{20}
 8 hydrocarbyl radicals wherein one or more hydrogen atoms is replaced
 9 by a halogen atom, C_1-C_{20} hydrocarbyl-substituted metalloids
 10 radicals wherein the metalloid is selected from the Group IV A of the
 11 Periodic Table of Elements, and halogen radicals or $(C_5H_{4-x}R_x)$
 12 is a cyclopentadienyl ring in which two adjacent R-groups are joined
 13 forming C_4-C_{20} ring to give a saturated or

14 unsaturated polycyclic cyclopentadienyl ligand;
15 (JR'_{z-2}) is a heteroatom ligand in which J is an
16 element with a coordination number of three from Group V A or an
17 element with a coordination number of two from Group VI A of the
18 Periodic Table of Elements, and each R' is, independently a radical
19 selected from a group consisting of C₁-C₂₀ hydrocarbyl radicals,
20 substituted C₁-C₂₀ hydrocarbyl radicals wherein one or more
21 hydrogen atoms is replaced by a halogen atom, and "z" is the
22 coordination number of the element J;
23 each Q is, independently any univalent anionic ligand
24 or or two Q's are a divalent anionic chelating ligand;
25 B is a covalent bridging group containing a Group IV A
26 or V A element; and
27 L is a Lewis base where "w" denotes a number from 0 to
28 3.

1 2. The compound of claim ²⁵ 1 wherein the heteroatom ligand
2 group J element is nitrogen, phosphorous, oxygen or sulfur.

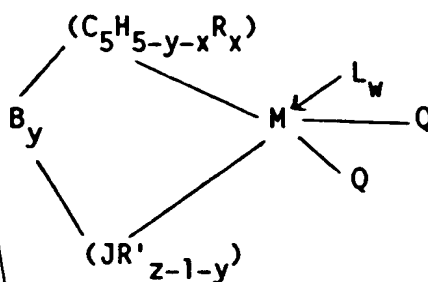
1 3. The compound of claim 6 wherein Q is a halogen or
2 hydrocarbyl radical.

1 4. The compound of claim 2 wherein the heteroatom ligand
2 group J element is nitrogen.

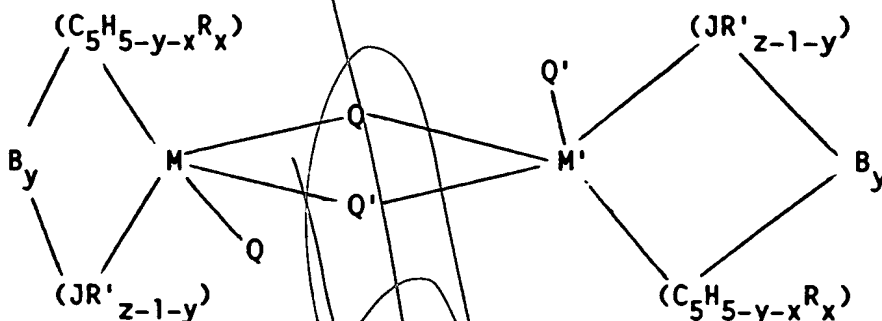
1 5. The compound of claim ²⁵ 1 wherein M is zirconium or
2 hafnium.

1 6. The compound of claim ²⁵ 1 wherein Q is independently,
2 halogen, hydride, or a substituted or unsubstituted C₁-C₂₀
3 hydrocarbyl, alkoxide, aryloxy, amide, arylamide, phosphide or
4 arylphosphide, provided that where any Q is a hydrocarbyl such Q is
5 different from (C₅H_{4-x}R_x) or both together are an alkylidene
6 or a cyclometallated hydrocarbyl.

- 1 7. A catalyst system comprising:
 2 (A) a Group IV B transition metal component of the
 3 formula:



or



- 4 wherein M is Zr, Hf or Ti;
 5 $(C_5H_{5-y-x}R_x)$ is a cyclopentadienyl ring which is
 6 substituted with from zero to five groups R, "x" is 1, 2, 3, 4 or 5
 7 denoting the degree of substitution, and each R is, independently, a
 8 radical selected from a group consisting of C_1-C_{20} hydrocarbyl
 9 radicals, C_1-C_{20} substituted hydrocarbyl radicals wherein one or
 10 more hydrogen atoms are replaced by a halogen atom, C_1-C_{20}
 11 hydrocarbyl-substituted metalloid radicals wherein the metalloid is
 12 selected from the Group IV A of the Periodic Table of Elements and
 13 halogen radicals or $(C_5H_{5-y-x}R_x)$ is a cyclopentadienyl ring in
 14 which two adjacent R-groups are joined forming C_4-C_{20} ring to
 15 give a saturated or unsaturated polycyclic cyclopentadienyl ligand;
 16 (JR'_{z-1-y}) is a heteroatom ligand in which J is an
 17 element with a coordination number of three from Group V A or an

18 element with a coordination number of two from Group VI A of the
19 Periodic Table of Elements, each R' is, independently a radical
20 selected from a group consisting of C₁-C₂₀ hydrocarbyl radicals,
21 substituted C₁-C₂₀ hydrocarbyl radicals wherein one or more
22 hydrogen atoms is replaced by a halogen atom, and "z" is the
23 coordination number of the element J;

24 each Q is, independently any univalent anionic ligand
25 or two Q's are a divalent anionic chelating agent;

26 "y" is 0 or 1 when w is greater than 0; y is 1 when w
27 is 0, when "y" is 1, B is a covalent bridging group containing a
28 Group IV A or V A element;

29 L is a Lewis base where "w" denotes a number from 0 to
30 3; and

31 (B) an alumoxane.

1 8. The catalyst system of claim 7 wherein the heteroatom
2 ligand group J element is nitrogen, phosphorous, oxygen or sulfur.

1 9. The catalyst system of claim 13 wherein Q is a halogen
2 or hydrocarbyl radical.

1 10. The catalyst system of claim 8 wherein the heteroatom
2 ligand group J element is nitrogen.

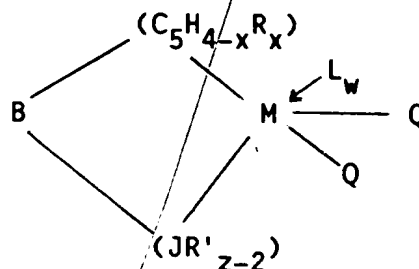
1 11. The catalyst system of claim 7 wherein M is zirconium
2 or hafnium.

1 12. The catalyst system of claim 7 wherein the mole ratio
2 of Al:M is from 10:1 to about 20,000:1.

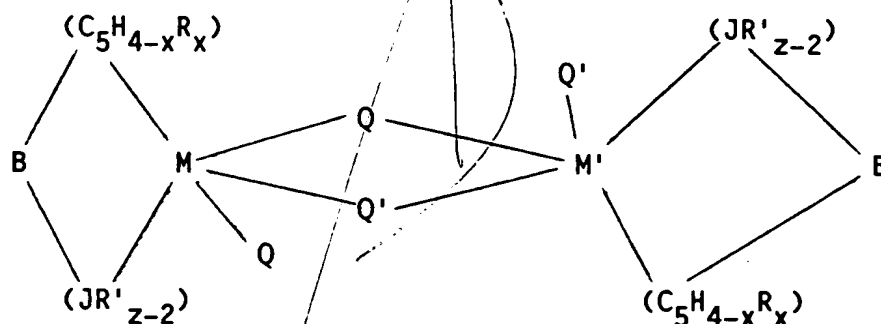
1 13. The catalyst system of claim 7 wherein Q is
2 independently halogen, hydride, or a substituted or unsubstituted
3 C₁-C₂₀ hydrocarbyl, alkoxide, aryloxy, amide arylamide,
4 phosphide or arylphosphide, provided that where any Q is a
5 hydrocarbyl such Q is different from (C₅H_{4-x}R_x) or both

6 together are an alkylidene or a cyclometallated hydrocarbyl.

1 14. A process producing a compound represented by the
2 formula:



or



3 wherein M is Zr, Hf or Ti;

4 $(C_5H_{4-x}R_x)$ is a cyclopentadienyl ring which is
5 substituted with from zero to four substituent groups R, "x" is 0, 1,
6 2, 3, or 4 denoting the degree of substitution, and each substituent
7 group R is, independently, a radical selected from a group consisting

8 of C_1-C_{20} hydrocarbyl radicals, substituted C_1-C_{20}
9 hydrocarbyl radicals wherein one or more hydrogen atoms is replaced
10 by a halogen atom, C_1-C_{20} hydrocarbyl-substituted metalloid
11 radicals wherein the metalloid is selected from the Group IV A of the
12 Periodic Table of Elements, and halogen radicals or $(C_5H_{4-x}R_x)$
13 is a cyclopentadienyl ring in which two adjacent R-groups are joined
14 forming C_4-C_{20} ring to give a saturated or unsaturated polycyclic
15 cyclopentadienyl ligand;

16 (JR'_{z-2}) is a heteroatom ligand in which J is an
17 element with a coordination number of three from Group V A or an
18 element with a coordination number of two from Group VI A of the
19 Periodic Table of Elements, and each R' is, independently a radical
20 selected from a group consisting of C_1-C_{20} hydrocarbyl radicals,
21 substituted C_1-C_{20} hydrocarbyl radicals wherein one or more
22 hydrogen atoms is replaced by a halogen atom, and "z" is the
23 coordination number of the element J;

24 each Q is, independently any univalent anionic ligand
25 or two Q's are a divalent anionic chelating agent;

26 B is a covalent bridging group containing a Group IV A
27 or V A element; and

28 L is a Lewis base where "w" denotes a number from 0 to
29 3;

30 consisting of reacting of d^0 Group IV B transition
31 metal halide with a salt containing an anion of the formula
32 $[(C_5H_{4-x}R_x)-B-(JR'_{z-2})]^{2-}$ and either two cations from the
33 Group I A of the Periodic Table of Elements or one cation from the
34 Group II A of the Periodic Table of Elements.

1 15. The process of claim 14 wherein the cation is lithium.

1 16. The process of claim 14 wherein the Group IV B metal
2 halide is zirconium (IV) chloride or hafnium (IV) chloride.

1 17. The process of claim 14 wherein Q is independently
2 halogen, hydride, or a substituted or unsubstituted C_1-C_{20}

3 hydrocarbyl, alkoxide, aryloxy, amide, arylamide, phosphide or
4 arylphosphide, provided that where any Q is a hydrocarbyl such Q is
5 different from $(C_5H_{4-x}R_x)$, or both Q together are an alkydene
6 or a cyclometallated hydrocarbyl.